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Proposed Registration Decision PRD2012-25

Mono- and Di-Potassium Salts of Phosphorous Acid

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Overview

Proposed Registration Decision for Mono- and Di-Potassium Salts of Phosphorous Acid

Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Winfield Phosphite TGAI, Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf, and Confine Post, containing the active ingredient mono- and di-potassium salts of phosphorous acid, for the control of certain diseases on potatoes; fruiting vegetables; basil; brassica leafy vegetables; leafy vegetables; cucurbits; grapes; ginseng; strawberries; outdoor ornamentals; conifers and trees; and turf grasses.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

This Overview describes the key points of the evaluation, while the Science Evaluation provides detailed technical information on the human health, environmental and value assessments of Winfield Phosphite TGAI, Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf, and Confine Post.

What Does Health Canada Consider When Making a Registration Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable[1] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its proposed conditions of registration. The Act also requires that products have value[2] when used according to the label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

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1 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act*.

2 "Value" as defined by subsection 2(1) of the *Pest Control Products Act*: "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (*a*) efficacy; (*b*) effect on host organisms in connection with which it is intended to be used; and (*c*) health, safety and environmental benefits and social and economic impact."

To reach its decisions, the PMRA applies modern, rigorous risk-assessment methods and policies. These methods consider the unique characteristics of sensitive subpopulations in humans (for example, children) as well as organisms in the environment (for example, those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides, the assessment process and risk-reduction programs, please visit the Pesticides and Pest Management portion of Health Canada's website at healthcanada.gc.ca/pmra.

Before making a final registration decision on Winfield Phosphite TGAI containing Mono- and Di-Potassium Salts of Phosphorous Acid, the PMRA will consider all comments received from the public in response to this consultation document.[3] The PMRA will then publish a Registration Decision[4] on Winfield Phosphite TGAI containing Mono- and Di-Potassium Salts of Phosphorous Acid, which will include the decision, the reasons for it, a summary of comments received on the proposed final registration decision and the PMRA's response to these comments.

For more details on the information presented in this Overview, please refer to the Science Evaluation of this consultation document.

What Are Mono- and Di-Potassium Salts of Phosphorous Acid?

Mono- and di-potassium salts of phosphorous acid are fungicide active ingredients belonging to Group 33 as designated by the Fungicide Resistance Action Committee and are classified as phosphonates. The mode of action of phosphorous acid is both direct and indirect, and involves the induction of host plant resistance and the inhibition of oxidative phosphorylation. Mono- and di-potassium salts of phosphorous acid are the active ingredients contained in Winfield Phosphite TGAI, Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf and Confine Post.

Winfield Phosphite TGAI is based on the precedent technical grade active ingredient (TGAI), mono- and di-potassium salts of phosphorous acid (Registration Number 29099). Confine Post is based on the precedent product Confine (Registration Number 29100) which is registered for suppression of late blight and pink rot on harvested potato tubers. The major new uses proposed are for Winfield Phosphite Colorless and Winfield Phosphite Extra use on potatoes; fruiting vegetables; basil; brassica leafy vegetables; leafy vegetables; cucurbits; grapes; ginseng; strawberries; outdoor ornamentals; conifers and trees and for Winfield Phosphite Turf use on grass turfs.

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3 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

4 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

Health Considerations

Can Approved Uses of Uses of Mono- and Di-Potassium Salts of Phosphorous Acid Affect Human Health?

Mono- and di-potassium salts of phosphorous acid is unlikely to affect human health when used according to label directions.

Exposure to mono- and di-potassium salts of phosphorous acid may occur when handling and applying the product. When assessing health risks, two key factors are considered: the levels where no health effects occur and the levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (for example, children and nursing mothers). Only uses for which the exposure is well below levels that cause no effects in animal testing are considered acceptable for registration.

Mono- and di-potassium salts of phosphorous acid is of low toxicity by the oral, dermal and inhalation routes, and minimally irritating to the eyes. The available information suggests that it is unlikely to have any short-term or prenatal developmental effects, as well as any significant genotoxic effects. The precautionary label statement indicating that contact with skin, eyes, and clothing must be avoided, and the personal protective equipment statement that applicators and other handlers must wear a long-sleeved shirt, long pants, gloves, shoes plus socks, and protective eyewear are effective mitigative measures to reduce the risk associated with the use of mono- and di-potassium salts of phosphorous acid.

Residues in Water and Food

Dietary risks from food and water are not of concern.

Dietary risk to humans is considered negligible based on a long history of use and the low toxicity of the end-use products. The available literature suggests that there is no toxicological concern from ingestion of the end-use product residues.

It is anticipated that the proposed uses of mono- and di-potassium salts of phosphorous acid in Canada on food crops will not pose a risk to any segment of the population including infants, children, adults and seniors, from consumption of produce from treated crops. In the United States, phosphorous acid has been designated Generally Regarded as Safe (GRAS) and the potassium salts of phosphoric acid have been exempted from the requirement of tolerance in and on all food commodities when used as an agricultural fungicide on food crops. The United States Environmental Protection Agency (USEPA) introduced an initiative whereby an exemption from the requirement of tolerance was established for ammonium, sodium, and potassium salts of phosphorous acid on all food commodities to permit post-harvest application to stored potatoes at 35 600 ppm or less of phosphorous acid.

No risk due to exposure from drinking water is anticipated as the end-use products are not to be applied near or directly to water and are likely to be degraded in the environment.

Occupational Risks From Handling End-use Products Containing Mono- and Di-Potassium Salts of Phosphorous Acid

Occupational exposure to individuals mixing, loading, or applying end-use products containing mono- and di-potassium salts of phosphorous acid is not expected to result in unacceptable risk when the end-use products are used according to label directions.

Precautionary (for example, wearing of personal protective equipment) and hygiene statements on the label are considered adequate to protect individuals from occupational exposure. Since the application is done by commercial applicators, exposure to bystanders is expected to be negligible.

Environmental Considerations

What Happens When Mono- and Di-Potassium Salts of Phosphorous Acid Is Introduced Into the Environment?

Mono- and di-potassium salts of phosphorous acid are not expected to pose a risk to the environment when used as a fungicide.

Mono- and di-potassium salts of phosphorous acid will enter the environment when used as a fungicide on field crops, ornamentals, turf, and potatoes in storage. Mono- and di-potassium salts of phosphorous acid produce phosphite ions when in contact with water. Over time, in soil, phosphite ions can be directly taken up by plant roots, slowly transform to phosphate (a plant nutrient), or bind with other substances in the soil. When phosphite ions get into lakes and rivers, it is expected that the phosphite will remain in the water phase. Phosphorous, in the form of phosphite, is not expected to be used by aquatic plants as a nutrient, but there is evidence that it could be used by certain kinds of bacteria. Mono- and di-potassium salts of phosphorous acid are not expected to accumulate in fish or other animals. It is also not expected that mono- and di-potassium salts of phosphorous acid will pose a risk to non-target terrestrial and aquatic species given its low toxicity to these organisms.

Value Considerations

What Is the Value of Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf, and Confine Post

Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf and Confine Post are non-conventional fungicides with systemic properties that suppress major oomycete diseases, including downy mildews, on a wide range of crops. These products also pose a low risk of pest resistance development. These characteristics make them a valuable option for integration into spray programs.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law.

The key risk-reduction measures being proposed on the label of Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf, and Confine Post to address the potential risks identified in this assessment are as follows.

Key Risk-Reduction Measures

Human Health

Because the technical product (Winfield Technical) containing mono- and di-potassium salts of phosphorous acid is used for formulating the commercial end-use products (Winfield Colorless, Winfield Extra, Winfield Turf, and Confine Post), the statement:

"Prevent access by unauthorized personnel" in the precaution section of the technical label will help mitigate the inappropriate use of the product, and help avoid accidental exposure. Other precautionary statements on the technical product and all end-use product labels, such as: "Avoid breathing vapors or spray mist, avoid contact with eyes, skin or clothing; remove contaminated clothing and wash clothing before use; applicators and/or other handlers must wear protective eyewear, long pants and long sleeved shirt, waterproof gloves, and shoes plus socks," should be effective in minimizing the potential for exposure.

Environment

No mitigative measures are required other than the standard precautionary label statements required for all commercial products.

Next Steps

Before making a final registration decision on mono- and di-potassium salts of phosphorous acid, the PMRA will consider all comments received from the public in response to this consultation document. The PMRA will accept written comments on this proposal up to 45 days from the date of publication of this document. Please forward all comments to Publications (contact information on the cover page of this document). The PMRA will then publish a Registration Decision, which will include its decision, the reasons for it, a summary of comments received on the proposed final decision and the Agency's response to these comments.

Other Information

When the PMRA makes its registration decision, it will publish a Registration Decision on mono- and di-potassium salts of phosphorous acid (based on the Science Evaluation section of this consultation document). In addition, the test data referenced in this consultation document will be available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa).

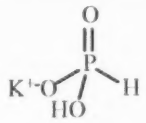
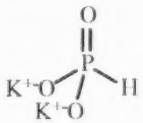
Science Evaluation

Mono- and Di-Potassium Salts of Phosphorous Acid

1.0 The Active Ingredient, Its Properties and Uses

1.1 Identity of the Active Ingredient

Active substance

Function	Fungicide	
Chemical name		
1. International Union of Pure and Applied Chemistry (IUPAC)	Monopotassium phosphonate and Dipotassium phosphonate	
2. Chemical Abstracts Service (CAS)	Phosphonic acid, monopotassium salt and Phosphonic acid, dipotassium salt	
CAS number	Monopotassium phosphonate Dipotassium phosphonate	13977-65-6 13492-26-7
Molecular formula	Monopotassium phosphonate Dipotassium phosphonate	KH_2PO_3 K_2HPO_3
Molecular weight	Monopotassium phosphonate Dipotassium phosphonate	120.09 158.19
Structural formula		
	13977-65-6	13492-26-7
Purity of the active ingredient	53.0%	

1.2 Physical and Chemical Properties of the Active Ingredient and End-Use Product

Technical Product—Winfield Phosphite TGAI

Property	Result
Colour and physical state	Colorless liquid
Odour	Faint
Melting range	Not Applicable
Boiling point or range	100.0°C
Density	1.468 g/mL
Vapour pressure at 20°C	The product is an aqueous liquid
Ultraviolet (UV)-visible spectrum	The product is not likely to absorb > 350 nm
Solubility in water at 20°C	Miscible
Solubility in organic solvents	Insoluble in organic solvents
n-Octanol–water partition coefficient (K_{ow})	Insoluble in octanol
Dissociation constant (pK_a)	pK_{a1} = 1.543 pK_{a2} = 6.572
Stability (temperature, metal)	Unstable to metal and metal ions (iron powder, ferric acetate, aluminum powder, aluminum acetate)

End-use Product—Winfield Phosphite Colorless

Property	Result
Colour	Colorless
Odour	Faint
Physical state	Liquid
Formulation type	Solution
Guarantee	53%
Container material and description	Poly containers, wire caged poly totes, PVC containers
Density	1.468 g/mL
pH of 1% dispersion in water	6.27

Property	Result
Oxidizing or reducing action	The product is neither an oxidant nor a reductant
Storage stability	Stable in HPDE containers at ambient temperatures
Corrosion characteristics	Not corrosive to HDPE packaging material
Explodability	The product is not expected to be explosive

End-use Product—Winfield Phosphite Turf

Property	Result
Colour	Colorless
Odour	Faint
Physical state	Liquid
Formulation type	Solution
Guarantee	53%
Container material and description	Poly containers, wire caged poly totes, PVC containers
Density	1.468 g/mL
pH of 1% dispersion in water	6.27
Oxidizing or reducing action	The product is neither an oxidant nor a reductant
Storage stability	Stable in HPDE containers at ambient temperatures
Corrosion characteristics	Not corrosive to HDPE packaging material
Explodability	The product is not expected to be explosive

End-use Product—Winfield Phosphite Extra

Property	Result
Colour	Red
Odour	Faint
Physical state	Liquid
Formulation type	Solution
Guarantee	53%
Container material and description	Poly containers, wire caged poly totes, PVC containers
Density	1.468 g/mL
pH of 1% dispersion in water	6.27
Oxidizing or reducing action	The product is neither an oxidant nor a reductant
Storage stability	Stable in HPDE containers at ambient temperatures
Corrosion characteristics	Not corrosive to HDPE packaging material
Explodability	The product is not expected to be explosive

End-use Product—Confine Post

Property	Result
Colour	Colorless
Odour	Faint
Physical state	Liquid
Formulation type	Solution
Guarantee	34%
Container material and description	Poly containers, wire caged poly totes, PVC containers
Density	1.468 g/mL
pH of 1% dispersion in water	6.27
Oxidizing or reducing action	The product is neither an oxidant nor a reductant
Storage stability	Stable in HPDE containers at ambient temperatures
Corrosion characteristics	Not corrosive to HDPE packaging material

Property	Result
Explodability	The product is not expected to be explosive

1.3 Directions for Use

Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf and Confine Post are intended for suppression of several oomycete diseases on various crops. They are to be applied in a preventative program, either as foliar, drench or post-harvest treatments. Four to nine foliar applications at 3-10 L/ha are recommended on most crops. Drench applications are for use against phytophthora root rot and foliar blight on outdoor ornamentals. Post-harvest treatments are intended for pink rot, late blight and silver scurf management on potatoes.

1.4 Mode of Action

Mono- and di-potassium salts of phosphorous acid (MDP) have systemic activity. Their mode of action is both direct and indirect, and involves the induction of host plant resistance and the inhibition of oxidative phosphorylation.

2.0 Methods of Analysis

2.1 Methods for Analysis of the Active Ingredient

The methods provided for the analysis of the active ingredient and the impurities in Winfield Phosphite TGAI have been validated and assessed to be acceptable for the determinations.

2.2 Method for Formulation Analysis

The methods provided for the analysis of the active ingredient in the formulations have been validated and assessed to be acceptable for use as an enforcement analytical method.

2.3 Methods for Residue Analysis

Not applicable

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

The PMRA has conducted a detailed review of the submitted data for mono- and di-potassium phosphorous acid. The submitted toxicity studies were carried out in accordance with currently accepted international testing protocols and Good Laboratory Practices. The scientific quality of the data is adequate to qualitatively assess the toxicological hazards of this pest control product. The submitted acute toxicity, irritation and sensitization studies with a formulation (Confine Extra, 54.46% w/w mono- and di-potassium salts of phosphorous acid) representing Winfield

Colorless, demonstrate that mono- and di- potassium salts of phosphorous acid is of low acute toxicity by oral, dermal, and inhalation routes, minimally irritating to the eyes, non-irritating to the skin, and is not a dermal sensitizer. The toxicology profile of Confine Extra indicates that the technical product and the associated end-use products are of low toxicological concern.

The submitted data waiver request for Winfield Extra containing a formulant dye was accepted as the addition of a minor quantity of a dye to the formulation is unlikely to affect the toxicity profile of Winfield Extra.

Information on short-term toxicity, developmental toxicity (prenatal), and genotoxicity were not available for mono- and di-potassium salts of phosphorous acid at the time of evaluation. However, based on the general toxicological information together with a long history of safe use as a commodity chemical and its use as a pesticide in Australia and the United States, it appears unlikely that treatment related effects will result from exposure to mono- and di-potassium salts of phosphorous acid.

The mutagenicity of mono- and di-potassium salts of phosphorous acid was assessed with the reverse gene mutation assay in bacteria (Ames assay). *Salmonella* Typhimurium strains TA 97, TA 98, TA 100, TA 1535 and TA 1537 and *E. coli* WP2uvrA were exposed to Agri-Fos 400, containing 45.5% w/w mono-and di-potassium salts of phosphorous acid, (313, 625, 1250, 2500, and 5000 µg/plate) with and without metabolic activation (S9). The findings were negative in that there was no evidence of a treatment-related response over background.

3.1.1 Incident Reports

Since April 26, 2007, registrants have been required by law to report incidents, including adverse effects to health and the environment, to the PMRA within a set time frame. Information on the reporting of incidents can be found on the Health Canada website. Incidents from Canada were searched for pesticide products containing the active ingredient mono- and di-potassium salts of phosphorous acid.

As of June 27, 2012, there has been one human incident reported to the PMRA involving the active ingredient mono- and di-potassium salts of phosphorous acid. In this Human Minor incident, it is highly probable that the symptoms of irritated eye and altered taste in mouth were related to exposure to the end-use product containing mono- and di-potassium salts of phosphorous acid which splashed into the eyes and mouth.

Although the information from the incident report supported the current toxicity database for mono- and di-potassium salts of phosphorous acid, it did not impact the risk assessment for the TGAI in the current applications. The toxicology profile of the TGAI indicates that it is minimally irritating to eyes and it is of low acute toxicity by the oral route.

3.2 Food Residue Exposure Assessment

The end-use products (Winfield Phosphite Colorless, Winfield Phosphite Extra, and Confine Post) are proposed for uses on potatoes, fruiting vegetables, leafy vegetables, brassica leafy vegetables, cucurbit vegetables, basil, grapes, berries, and strawberries to control or suppress several diseases, including late blight, pink rot, silver scurf, downy mildew, anthracnose fruit rot, leather rot, and phytophthora root rot. A pre-harvest interval (PHI) of 1 day is proposed for crops treated with Winfield Phosphite Colorless and Winfield Phosphite Extra.

Due to the low toxicity of mono- and di-potassium salts of phosphorous acid, and its long history of use as an agrochemical, no adverse effects are anticipated from the presence of residues on food. In the United States, phosphorous acid is classified by the Food and Drug Administration as Generally Regarded as Safe (GRAS). The salts of phosphorous acid have been exempted from the requirement of tolerance in, and on, all food commodities when used as an agricultural fungicide on food crops.

There is reasonable certainty that no harmful effects will result from dietary exposure to residues of mono- and di-potassium salts of phosphorous acid from the proposed uses on food crops in the general population and potentially sensitive subpopulations, including infants and children.

Furthermore, while good hygiene practices, such as washing food produce prior to consumption, are not considered in the assessment for the registration of a food-use pesticide, they are recommended as any remaining residues are likely to be reduced by washing and possible cooking of the treated crop before eating.

3.2.1 Drinking Water

Although the end-use products will be used for agricultural crops outdoors, as well as in contained treatment areas, they are not to be applied near or directly to water, and they are likely to be degraded in the environment rapidly. No risk due to exposure from drinking water is anticipated.

3.2.2 Maximum Residue Limits (MRLs)

The promulgation of an MRL for mono- and di-potassium salts of phosphorous acid and establishment of an acceptable daily intake was not required because: 1) Division B.15.002(2) of the Food and Drug Regulations provides a list of 7 agricultural chemicals which are exempt from the requirement of setting an Maximum Residue Limit (MRL), one of which is mono- and dibasic sodium, potassium, and ammonium phosphate, 2) Phosphorous acid has been designated Generally Regarded As Safe (GRAS) and the potassium salts of phosphoric acid have been exempted from the requirement of tolerance in and on all food commodities when used as an agricultural fungicide on food crops in the United States, and 3) There are no Codex MRLs established for mono- and di-potassium salts of phosphorous acid.

3.3 Occupational Exposure and Risk Assessment

3.3.1 Use Description

The end-use products (Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Turf, and Confine Post) are proposed for uses on a number of food crops, ornamental and bedding plants, and turf to control or suppress several diseases, including late blight, pink rot, silver scurf, downy mildew, anthracnose fruit rot, leather rot, phytophthora root rot, and pythium blight.

The proposed end-use product applications include: 1) Foliar application through normal boom sprayers for typical crops, 2) Application through irrigation and chemigation equipment, 3) Airblast application for grapes, and 4) Post-harvest treatment of potatoes using an automated system.

Application for post-harvest treatment is done mainly during the harvesting and storage period in the autumn. The end-use products are to be applied only once, as a low volume spray to harvested potatoes as they are being automatically loaded into bulk storage bins. An enclosed spray chamber mounted on the conveyor sprays newly-harvested potatoes as they pass along a conveyor belt towards storage bins.

3.3.2 Mixer, Loader and Applicator Exposure and Risk Assessment

Occupational exposure to the mixer, loader, and applicator, as well as those responsible for clean-up and maintenance activities is anticipated to be minimal. Applicator exposure pertains only to foliar application by boomsprayers or airblast applications. Workers will be primarily exposed by the dermal route during handling, application, and re-entering freshly treated areas. Inhalation exposure from spray drift is also possible during application.

The labels have a number of exposure reduction statements (for example, wearing of personal protective equipment, clothing, hygiene statement) to protect mixers, loaders and applicators against any unnecessary risk from exposure. The labels instruct that applicators and other handlers must wear protective eyewear, long pants and long sleeved shirt, waterproof gloves, and shoes plus socks; also, avoid breathing of vapors or spray mist, avoid contact with eyes, skin or clothing, and remove contaminated clothing and wash clothing before reuse, which should be effective in minimizing the potential for exposure.

Significant risk from exposure to mono- and di-potassium salts of phosphorous acid for the mixer, loader and applicator, as well as those responsible for clean-up, maintenance and repair activities is not anticipated due to the low toxicity of the active ingredient and reduced occupational exposure when label directions are followed.

3.3.3 Bystander Exposure

As the commercial application involves only authorized personnel, bystander exposure is expected to be negligible when the end-use products are used according to the label directions.

3.3.4 Postapplication Exposure

Postapplication exposure is possible when people enter the treated area soon after the application. The primary route of exposure for re-entry workers/individuals is dermal from contact with freshly treated surfaces.

Since most of the proposed re-entry activities are likely to take place after the drying of treated surfaces, such as, pruning/harvesting/transplanting, mowing of turf and removal of grass clippings, there is no concern of dermal exposure from postapplication activities. Moreover, the end-use products have low dermal toxicity and low irritation potential, which limit unnecessary risk to individuals from postapplication exposure.

4.0 Impact on the Environment

Mono- and di-potassium salts of phosphorous acid were eligible for an evaluation under Regulatory Directive DIR2012-01, *Guidelines for the Registration of Non-Conventional Pest Control Products*. Mono- and di-potassium salts of phosphorous acid have a low toxicity profile and a long history of use and, as such, a reduced database (including only acute toxicity information) was deemed sufficient to characterize the potential risks to the environment from the use of this fungicide.

4.1 Fate and Behaviour in the Environment

Mono- and di-potassium salts of phosphorous acid are highly soluble in water and will rapidly dissociate to yield hydrogen and phosphite ions. As a result, the phosphite ions will be readily removed from plant surfaces by rain wash-off. Over time, in soil, phosphite ions can be taken up directly by plant roots (as various salts), transformed to different oxidation states such as phosphate (an available form of phosphorous for plant nutrition), or can be bound up with other substances in soil. The conversion of phosphites to phosphates through microbial transformation in soil is, however, very slow. When phosphite enters aquatic systems, it is expected to remain in the water and not move to the sediment. Phosphite is not expected to be used as a nutrient (source of phosphorous) by aquatic plants and algae. There is, however, evidence indicating that certain microorganisms are able to metabolise this form of phosphorous. Mono- and di-potassium salts of phosphorous acid are insoluble in octanol which, therefore, suggests that it would not bioaccumulate in fish or other animals.

4.2 Environmental Risk Characterization

A qualitative risk assessment was conducted using the submitted information on the toxicity of mono- and di-potassium salts of phosphorous acid to non-target organisms (aquatic and terrestrial).

Environmental toxicology data for mono- and di-potassium salts of phosphorous acid are summarized in Appendix I, Table 2.

4.2.1 Risks to Terrestrial Organisms

No effects were noted for honeybees (contact exposure) or birds (acute oral and dietary exposures) when exposed to an end-use product containing mono- and di-potassium salts of phosphorous acid. The highest test concentrations in laboratory studies were much higher than concentrations expected to be found in the environment following the use of mono- and di-potassium salts of phosphorous acid as a fungicide. Therefore, the use of mono- and di-potassium salts of phosphorous acid is not expected to pose a risk to non-target terrestrial invertebrate and vertebrate species. Although no information was submitted regarding the toxicity of mono- and di-potassium salts of phosphorous acid to terrestrial vascular plants, this compound is not expected to pose a risk to non-target plants based on its long history of use as a fertilizer.

4.2.2 Risks to Aquatic Organisms

No effects were noted for *Daphnia magna* and the rainbow trout (*Oncorhynchus mykiss*) when exposed to an end-use product containing mono- and di-potassium salts of phosphorous acid. The test concentration in laboratory studies was much higher than concentrations expected to be found in the environment following the use of mono- and di-potassium salts of phosphorous acid as a fungicide. Therefore, given the low toxicity observed in laboratory studies, mono- and di-potassium salts of phosphorous acid are not expected to pose a risk to non-target aquatic organisms.

4.2.3 Incident reports (Environment)

No environmental incidents are reported in the PMRA database or the USEPA Ecological Incident Information System (EIIS) for Mono- and di-potassium salts of phosphorous acid (USEPA OPP Chemical Code 076416).

5.0 Value

5.1 Effectiveness Against Pests

5.1.1 Acceptable Efficacy Claims for Winfield Phosphite Colorless

Scientific evidence was presented in the form of over 300 field trials testing MDP or related active ingredients. Fifteen of the 27 proposed claims were supported The supported crops, application rates and application intervals were reflective of the tested use pattern. Additional value information is required for five claims either to confirm the consistency of effect of Winfield Phosphite Colorless or its efficacy across the crop group.

5.1.1.1 Foliar and sprinkler chemigation applications for suppression of late blight (*Phytophthora infestans*) and pink rot (*Phytophthora erythroseptica*) on potato

Five field trials tested MDP according to the proposed use pattern under Canadian environmental conditions. MDP applications to the foliage at the proposed rates significantly reduced late blight and pink rot incidence on harvested tubers by an average of 82% and 76%, respectively.

MDP was applied three times through sprinkler irrigation at 2.5, 5 and 10 L/ha in one field trial. Under high disease pressure, these rates provided an average of 99% and 89% reduction of late blight and pink rot incidence on harvested tubers, respectively. Levels of protection were statistically similar to that of the proposed foliar rates. The submitted efficacy data support the use of foliar and sprinkler chemigation applications of Winfield Phosphite Colorless Fungicide for suppression of potato late blight and pink rot.

5.1.1.2 Post-harvest application for suppression of late blight (*Phytophthora infestans*), pink rot (*Phytophthora erythroseptica*) and silver scurf (*Helminthosporium solani*) on potato

The MDP-containing fungicide Confine (Registration Number 29100) is registered for the same post-harvest uses as proposed. The applicant submitted information showing that the registered rates of Confine will deliver the same amount of active ingredient as the proposed rates of Winfield Phosphite Colorless Fungicide, and that efficacy will not be impacted. The claims are supported as proposed.

5.1.1.3 Foliar and sprinkler chemigation applications for suppression of late blight (*Phytophthora infestans*) on fruiting vegetables

The use of MDP for management of late blight may be extrapolated from potato to fruiting vegetables based on similarities in pest biology as well as crop seasonal growth, architecture and canopy size. Foliar and sprinkler chemigation applications of Winfield Phosphite Colorless Fungicide are supported for suppression of late blight on fruiting vegetables.

5.1.1.4 Foliar and sprinkler chemigation applications for suppression of phytophthora foliar blight (*Phytophthora* spp.) on fruiting vegetables

In one field trial, different MDP concentrations significantly reduced phytophthora foliar blight caused by *P. nicotianae* on tomato. In the submitted efficacy data package, MDP has also shown substantial efficacy against numerous *Phytophthora* species on a wide range of crops, including potato, ginseng, blueberry, strawberry and ornamentals. Based on these efficacy considerations, foliar and sprinkler chemigation applications of Winfield Phosphite Colorless Fungicide are supported for suppression of phytophthora foliar blight on fruiting vegetables. Confirmatory value information is required.

5.1.1.5 Foliar applications for suppression of downy mildew (*Hyaloperonospora parasitica*) on brassica leafy vegetables

A total of nine field trials on Chinese broccoli, broccoli, cabbage and collard were reviewed. The levels of protection achieved with MDP as well as the comparable efficacy with certain commercial standards were supportive of a suppression claim. The efficacy of MDP was shown across four crops from the brassica leafy vegetables. Foliar applications of Winfield Phosphite Colorless Fungicide are supported for suppression of downy mildew on brassica leafy vegetables.

5.1.1.6 Foliar applications for suppression of downy mildew (*Bremia lactucae*) on lettuce, endive and radicchio

Ten field trials were conducted on downy mildew of lettuce in support of the proposed claim. Foliar applications of MDP or related active ingredients suppressed or controlled downy mildew severity (>80% reduction) under high disease pressure, while providing a lower reduction of disease incidence. Foliar applications of Winfield Phosphite Colorless Fungicide are supported for suppression of downy mildew on leafy vegetable crops susceptible to *B. lactucae*, i.e. lettuce, endive and radicchio.

5.1.1.7 Foliar applications for suppression of downy mildew (*Peronospora belbahrii*) on basil

MDP was tested against basil downy mildew in three field trials. Three or four MDP applications at 3-5 L/ha significantly reduced downy mildew severity by an average of 57% under severe disease pressure. There are currently no fungicides registered against this aggressive disease in Canada. Foliar applications of Winfield Phosphite Colorless Fungicide are supported for suppression of basil downy mildew.

5.1.1.8 Foliar applications for suppression of phytophthora foliar blight (*Phytophthora capsici, P. nicotianae*) on cucurbit vegetables

Four field trials tested foliar applications of MDP against phytophthora foliar blight on pumpkin and cucumber. Rates and number of applications differed from the proposed label. Partial suppression to suppression was noted with MDP against phytophthora foliar blight. For example, MDP applied 10 times at 5.0 L/ha significantly reduced the proportion of infected pumpkin vines by 52% under moderate disease pressure. Foliar applications of Winfield Phosphite Colorless Fungicide are supported for suppression of phytophthora foliar blight on cucurbit vegetables. Confirmatory value information is required since the proposed use pattern for Winfield Phosphite Colorless Fungicide was not tested in the trials.

5.1.1.9 Foliar applications for suppression of downy mildew (*Pseudoperonospora cubensis*) on cucurbit vegetables

A total of 10 field trials were reviewed in support of the proposed claim. MDP significantly reduced downy mildew severity on butternut squash under severe disease pressure, but could not maintain its levels of protection under increasing disease pressures, similarly to the other tested fungicides. MDP did adequately suppress downy mildew on winter squash. MDP has also shown to be a valuable tank-mix partner in a fungicide spray program on pickling cucumbers in two field trials, although contrasting results were obtained on winter squash and cucumber. Foliar applications of Winfield Phosphite Colorless are supported for suppression of downy mildew on cucurbit vegetables.

5.1.1.10 Foliar applications for suppression of downy mildew (Plasmopara viticola) on grape

Wet weather conditions make it difficult for grape producers to maintain an adequate protection of new growth through a preventative spray program. A systemic fungicide such as Winfield Phosphite Colorless is thus critical in managing downy mildew on grape. It also has a much lower risk for disease resistance development than the currently available alternatives, and is not subject to major limitations from extended pre-harvest and re-entry intervals.

Six field trials conducted under moderate to high disease pressure were reviewed in support of the proposed claim. MDP or related active ingredients provided 67-99% reduction of downy mildew severity (average of 86% reduction) and a low reduction of disease incidence. Foliar applications of Winfield Phosphite Colorless are supported for suppression of downy mildew on grape.

5.1.1.11 Foliar applications for suppression of phytophthora foliar blight (*Phytophthora cinnamomi*) on highbush and lowbush blueberry

One field trial tested MDP against phytophthora root rot on highbush blueberry grown in bark beds. MDP was sprayed four times at 6 L/ha, at a timing corresponding to root growth flushes in the spring and fall. MDP significantly reduced phytophthora symptoms and provided numerically higher efficacy than the commercial standard. Similar results were achieved in a supplementary trial where assessments included symptoms from a disease complex including *Phytophthora*, *Pythium* and *Rhizoctonia*. Foliar applications of Winfield Phosphite Colorless are supported for suppression of phytophthora foliar blight on highbush and lowbush blueberry. Additional value information is required to confirm the consistency of effect of the product under Canadian conditions.

5.1.1.12 Foliar applications for suppression of anthracnose (*Colletotrichum acutatum*) on highbush and lowbush blueberry

Six field trials on blueberry, gooseberry/currant and cranberry were reviewed in support of the proposed claim. MDP resulted in a suppressive effect against blueberry anthracnose in the majority of trials when applied as proposed. However, low efficacy was achieved with MDP on crops other than blueberry. Therefore, the claim was not extrapolated to other crops. Foliar applications of Winfield Phosphite Colorless are supported for suppression of anthracnose on highbush and lowbush blueberry.

5.1.1.13 Foliar applications for suppression of leather rot (*Phytophthora cactorums*) on strawberry

In five field trials, MDP applied three to five times at 4 or 5 L/ha on a 7-day schedule consistently suppressed or controlled leather rot incidence on harvested fruits under moderate to high disease pressure. Foliar applications of Winfield Phosphite Colorless are supported for suppression of leather rot on strawberries.

5.1.1.14 Foliar and drench applications for suppression of phytophthora root rot and foliar blight (*Phytophthora* spp., except *P. ramorum* and *P. cryptogea*) on outdoor ornamentals, including bedding plants, potted plants and cut flowers

As part of an IR-4 high priority project, 40 products were tested from 2003-2007 as drench and/or foliar treatments against nine *Phytophthora* species causing root and stem/leaf blights on ornamental crops. MDP or related active ingredients were included in 29 trials and provided significant efficacy against phytophthora root rot and foliar blight, ranging from partial suppression to control. Most *Phytophthora* species, with the exception of *P. ramorum* and *P. cryptogea*, were sensitive to MDP. The efficacy of MDP, although variable, was shown across various ornamental crops, including azalea, poinsettia, Mexican cliffrose, rhododendron, snapdragon, marigold, vinca and flowering crabapple, regardless of trial location (greenhouse, nursery). Drench and foliar applications provided comparable levels of protection when compared side-by-side. Based on these efficacy results, foliar and drench applications of Winfield Phosphite Colorless are supported for suppression of phytophthora root rot and foliar blight on outdoor ornamentals, including bedding plants, potted plants and cut flowers.

5.1.1.15 Foliar applications for suppression of downy mildew (*Peronospora lamii*) on outdoor ornamentals, including bedding plants, potted plants and cut flowers

A total of two trials on coleus (greenhouse) and rose (commercial nursery) were provided in support of the proposed claim. Visual sporulation of downy mildew on coleus was assessed using a 1-4 rating scale. Three foliar applications of MDP at 1.3 L/ha significantly reduced sporulation ratings under moderate disease pressure. Disease incidence on leaves was also fully controlled three weeks after the last MDP application. On the other hand, low efficacy was noted against rose downy mildew in a nursery setting. Based on the efficacy data on greenhouse coleus as well as the lack of registered fungicides for downy mildew management on outdoor ornamentals, foliar applications of Winfield Phosphite Colorless are supported for suppression of

downy mildew caused by *P. lamii* on outdoor ornamentals, including bedding plants, potted plants and cut flowers. A genus designation (*Peronospora* spp.) cannot be supported at this time given the low efficacy results noted on rose downy mildew. Additional value information is required to confirm the product efficacy across ornamental crops and extend the claim to the genus *Peronospora*.

5.1.2 Acceptable Efficacy Claims for Winfield Phosphite Extra

Winfield Phosphite Extra and Winfield Phosphite Colorless have almost identical formulations and use patterns. Consequently, the acceptable efficacy claims for Winfield Phosphite Colorless are also supported for Winfield Phosphite Extra, with the exception of post-harvest uses on potatoes, which are not proposed for the latter product.

5.1.3 Acceptable Efficacy Claims for Winfield Phosphite Turf

A total of 16 trials (six on anthracnose basal rot, ten on pythium blight) conducted in the United States between 2000 and 2007 were submitted for review. Data submitted on anthracnose basal rot indicate partial suppression when applied as proposed. Although the results were statistically comparable to products registered for control of anthracnose, the efficacy expressed would not be considered acceptable on high value turf such as that found on golf courses or sod farms. Based on the performance of the phosphorous acid products and the aggressive nature of anthracnose basal rot, the claim of suppression of anthracnose basal rot cannot be supported at this time.

Seven trials conducted on pythium blight were reviewed. Application of MDP or related active ingredients at the proposed rates indicates suppression of pythium blight on golf course turfgrasses under moderate to severe disease pressure. No data or rationale were submitted to support application through irrigation systems. This application method is not supported.

5.1.4 Acceptable Efficacy Claims for Confine Post

Confine Post is a new formulation that contains 34% MDP. It is intended for the post-harvest suppression of late blight, pink rot and silver scurf on potatoes. Confine is registered for the same uses and contains 45.8% MDP. The primary reason for applying for registration of Confine Post is to improve the label directions for the use on harvested potatoes. Currently, the application of Confine is expressed as 1:4.3 ratio of the product with water. The directions for Confine Post direct the user to mix 500 mL of the product with 1500 mL of water in order to make a 2 L solution. This change allows for easier mixing of the product with water in the field. The applicant submitted information showing that the amount of active ingredient applied is similar for the two products and will have no impact on efficacy. The application to register Confine Post is supported with no additional value requirements.

5.2 Economics

No market analysis was performed for this application.

5.3 Sustainability

5.3.1 Survey of Alternatives

Refer to Appendix I, Tables 3.1-3.3 for a summary of the active ingredients currently registered for control or suppression of diseases indicated on the labels for Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf and Confine Post.

5.3.2 Compatibility with Current Management Practices Including Integrated Pest Management

Adequate cultural practices and sanitation measures are important means to prevent disease development in crops. MDP would not interfere with these preventative measures when used as recommended. MDP has shown to be compatible in tank-mix with fenamidone, mancozeb and chlorothalonil, which is indicative of its compatibility with conventional fungicides.

5.3.3 Information on the Occurrence or Possible Occurrence of the Development of Resistance

According to the Fungicide Resistance Action Committee, phosphonate fungicides such as MDP (Group 33) present a low risk of pest resistance development.

5.3.4 Contribution to Risk Reduction and Sustainability

MDP is effective in suppressing major oomycetes diseases, including downy mildews, on a wide range of crops. MDP is a non-conventional active ingredient that exhibits systemic properties as well as a low risk of pest resistance development. These characteristics make it a valuable option for the management of certain high-risk pathogens in crops where a limited number of alternatives are registered. This product is compatible with certain conventional fungicides and is intended for use as part of an integrated pest management program.

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e. persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the review process, mono- and di-potassium salts of phosphorous acid were assessed in accordance with the PMRA Regulatory Directive DIR99-03[5] and evaluated against the Track 1 criteria. The PMRA has reached the following conclusions:

> **Mono- and Di-potassium salts of phosphorous acid** do not meet Track 1 criteria, and are not considered Track 1 substances. These are inorganic substances. Mono- and di-potassium salts of phosphorous acid are insoluble in octanol and are, therefore, not expected to bioaccumulate in the environment.

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical and formulants and contaminants in the end-use products are compared against the *List of Pest control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*.[6] The list is used as described in the PMRA Notice of Intent NOI2005-01[7] and is based on existing policies and regulations including: DIR99-03; and DIR2006-02,[8] and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

> Winfield Phosphite TGAI and the end-use products Winfield Phosphite Colorless, Winfield Phosphite Turf, Winfield Phosphite Extra, and Confine Post do not contain any formulants or contaminants of health or environmental concern identified in the *Canada Gazette*.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and Regulatory Directive DIR2006-02.

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5 DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6 *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-114 (2005-11-30) pages 2641–2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613. *Part 1 Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

7 NOI2005-01, *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern under the New Pest Control Products Act.*

8 DIR2006-02, *Formulants Policy and Implementation Guidance Document.*

7.0 Summary

7.1 Human Health and Safety

The available information for mono- and di-potassium salts of phosphorous acid is adequate to qualitatively identify the toxicological hazards that may result from human exposure to mono- and di-potassium salts of phosphorous acid. Submitted information suggests that mono- and di-potassium salts of phosphorous acid is of low acute toxicity irrespective of the route of exposure and only minimally irritating to the eyes.

Although occupational exposure is expected, the precautionary statements on the product labels are sufficient to minimize any risk due to exposure of workers and bystanders.

Exposure to mono- and di-potassium salts of phosphorous acid from the diet or drinking water is not expected to be of concern. The PMRA did not require a maximum residue limit (MRL) to be established for mono- and di-potassium salts of phosphorous acid.

7.2 Environmental Risk

The use of mono- and di-potassium salts of phosphorous acid as a fungicide, according to the labels of Winfield Phosphite Colorless, Winfield Phosphite Turf, Winfield Phosphite Extra, and Confine Post, is not expected to pose a risk to terrestrial or aquatic non-target organisms.

7.3 Value

The submitted value information is adequate to support the suppression claims listed below each end-use product.

7.3.1 Winfield Phosphite Colorless / Winfield Phosphite Extra

- late blight and pink rot on potato [foliar, sprinkler chemigation]
- late blight, pink rot and silver scurf on potato [post-harvest] for Winfield Phosphite Colorless only
- late blight on fruiting vegetables [foliar, sprinkler chemigation]
- phytophthora foliar blight on fruiting vegetables [foliar, sprinkler chemigation]
- downy mildew on brassica leafy vegetables [foliar]
- downy mildew on lettuce, endive and radicchio [foliar]
- downy mildew on basil [foliar]
- phytophthora foliar blight on cucurbit vegetables [foliar]
- downy mildew on cucurbit vegetables [foliar]
- downy mildew on grape [foliar]
- phytophthora foliar blight on highbush and lowbush blueberry [foliar]
- anthracnose on highbush and lowbush blueberry [foliar]
- leather rot on strawberry [foliar]

- phytophthora root rot and foliar blight on outdoor ornamentals [foliar, drench]
- downy mildew on outdoor ornamentals [foliar]

Confirmatory value information is required for certain claims.

7.3.2 Winfield Phosphite Turf

- pythium blight on turf [foliar]

7.3.3 Confine Post

- late blight, pink rot and silver scurf on potato [post-harvest]

8.0 Proposed Regulatory Decision

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, is proposing full registration for the sale and use of Winfield Phosphite TGAI, Winfield Phosphite Colorless, Winfield Phosphite Extra, Winfield Phosphite Turf, and Confine Post, containing the active ingredient mono- and di-potassium salts of phosphorous acid, for the control of certain diseases on potatoes; fruiting vegetables; basil; brassica leafy vegetables; leafy vegetables; cucurbits; grapes; ginseng; strawberries; outdoor ornamentals; conifers and trees; and turf grasses.

An evaluation of available scientific information found that, under the approved conditions of use, the product has value and does not present an unacceptable risk to human health or the environment.

List of Abbreviations

µg	micrograms
µm	micrometres
a.i.	active ingredient
bw	body weight
CAS	Chemical Abstracts Service
cm	centimetres
d	day
DACO	data code
g	gram
h	hour
ha	hectare(s)
HDPE	High density polyethylene
IUPAC	International Union of Pure and Applied Chemistry
kg	kilogram
K_{ow}	*n*-octanol–water partition coefficient
L	litre
LC_{50}	lethal concentration 50%
LD_{50}	lethal dose 50%
m	metre(s)
MDP	mono- di-potassium salts of phosphorous acid
mg	milligram
mL	millilitre
nm	nanometre(s)
MAS	maximum average score
MIS	maximum irritation score
MRL	maximum residue limit
N/A	not applicable
PHI	preharvest interval
pK_a	dissociation constant
PMRA	Pest Management Regulatory Agency
poly	polyethylene
ppm	parts per million
PVC	polyvinylchloride
TGAI	technical grade active ingredient
TSMP	Toxic Substances Management Policy
USEPA	United States Environmental Protection Agency
UV	ultraviolet
w/w	weight per weight dilution

Appendix I Tables and Figures

Table 1 Toxicity Profile of Confine Extra (54.46% w/w mono- and di-potassium salts of phosphorous acid)

STUDY	SPECIES/STRAIN DOSES	RESULT	TARGET ORGAN/SIGNIFICANT EFFECTS/COMMENTS	REFERENCES
Oral (Up and Down Method)	Sprague-Dawley rats 4 rats/dose (♀) 5000 mg/kg bw by gavage	LD_{50} ♀: > 5000 mg/kg bw	1 mortality. Piloerection and ano-genital staining were noticed in 1 animal. No gross abnormalities noticed at necropsy. **Low acute oral toxicity**	1879537
Dermal	Sprague-Dawley rats 5 rats/sex/dose 5000 mg/kg bw applied for 24 hours	LD_{50} ♂ & ♀: > 5000 mg/kg bw	Transient erythema was observed at one dose site. No gross abnormalities were noted at necropsy. **Low acute dermal toxicity**	1879539
Inhalation (Nose-only exposure route)	Sprague-Dawley rats 5 rats/sex Gravimetric chamber concentration of 2.06 mg/L, mass median aerodynamic diameter of 2.5 µm, and exposure period of 4 hours	LC_{50} ♂ & ♀ > 2.06 mg/L	There were no treatment related effects. **Low acute inhalation toxicity**	1879541
Primary eye irritation (Draize method)	New Zealand albino rabbits 3 ♂ rabbits/dose Dosed with 0.1mL of the test substance and left unwashed. Ocular irritation was scored at 1, 24, 48 and 72 hours post-instillation.	MAS [a] = 0.22/110 MIS [b] = 11.66/110 (1hour)	No corneal opacity. 1 hour post-instillation, all 3 treated eyes exhibited iritis and one of them exhibited conjunctivitis, which were resolved within 72 hours of the treatment. **Minimally irritating to the eye**	1879542
Primary dermal irritation (Draize method)	New Zealand albino rabbits 3 ♂/dose 0.5 mL of the test substance applied to one 6 –cm^2 intact dose site per animal for 4 hour exposure under occlusion	MAS [a] = 0/8 MIS [b] = 0/8	There were no treatment related effects. **Non irritating to the skin**	1879543
Dermal Sensitization (Buehler Method)	Hartley-Albino Guinea pigs 34 ♂ & ♀ guinea pigs Naive control: 10 animals Treatment group (Dosed with 0.4 mL of the test substance): 20 animals Preliminary trial: 4 animals Treatment group animals were challenged 27 days after the first induction dose with 0.4 mL test substance.	Negative results.	No treatment related effects were observed. No dermal irritation at any test site during the challenge phase. Historical positive control validation study validates the test system used in this study. **Negative skin sensitizer**	1879544

[a] MAS = Maximum Average Score for 24, 48 and 72 hours

[b] MIS = Maximum Irritation Score (average)

Table 2 Toxicity to Non-Target Species

Organism	Exposure	Test substance[a]	Endpoint value	Degree of toxicity[a]	PMRA#
Terrestrial					
Invertebrates					
Bee (*apis mellifera*)	48h-Contact	Confine Extra	LD_{50} >13.3 µg a.i./bee	Relatively non-toxic	2076065
Birds					
Mallard (*Anas platyrhynchos*)	Acute	Confine Extra	LD_{50} > 1060 mg a.i./kg bw	Practically non-toxic	2076069
	8d-Dietary	Confine Extra	LC_{50} >5000ppm (LD_{50} = 734.2 mg a.i./kg bw/day)	Practically non-toxic	2076070
Vascular plants					
Crop species	No information was submitted. Based on history of use as a fertilizer and known uptake by plants, not expected to have adverse effects on terrestrial vascular plants at the proposed rates of use.				
Aquatic					
Freshwater species					
Daphnia magna	48h-Acute	Confine Extra	LC_{50} > 544.6 mg a.i./L	Practically non-toxic	2076066
Rainbow trout (*Oncorhynchus mykiss*)	96h-Acute	Confine Extra	LC_{50} > 544.6 mg a.i./L	Practically non-toxic	2076068

[a] Confine Extra: 54.46% w/w mono- and di-potassium salts of phosphorous acid

Table 3.1 Summary of Fungicide Alternatives for the Uses Supported with Winfield Phosphite Colorless / Winfield Phosphite Extra[a]

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
Potato	Late blight	metalaxyl (4) + mancozeb (M3) metalaxyl (4) + chlorothalonil (M5) azoxystrobin (11) famoxadone (11) + cymoxanil (27) pyraclostrobin (11) pyraclostrobin (11) + metiram (M3) cyazofamid (21) zoxamide (22) zoxamide (22) + mancozeb (M3) cymoxanil (27) propamocarb hydrochloride (28) propamocarb hydrochloride (28) + chlorothalonil (M5) fluazinam (29) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) dimethomorph (40) + ametoctradin (45) mandipropamid (40) fluopicolide (43) ametoctradin (45) copper (M1) mancozeb (M3) metiram (M3) captan (M4) chlorothalonil (M5)

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
	Pink rot	metalaxyl (4) metalaxyl (4) + mancozeb (M3) metalaxyl (4) + chlorothalonil (M5) azoxystrobin (11) mono- and di-basic sodium, potassium and ammonium phosphites (33) mancozeb (M3) + chlorothalonil (M5)
Potato (post-harvest)	Late blight	mono- and di-basic sodium, potassium and ammonium phosphites (33)
	Pink rot	mono- and di-basic sodium, potassium and ammonium phosphites (33)
	Silver scurf	iprodione (2) mono- and di-potassium salts of phosphorous acid (33) *Bacillus subtilis* strain QST 713 (44)
Fruiting vegetables[b]	Late blight	pyraclostrobin (11) famoxadone (11) + cymoxanil (27) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) dimethomorph (40) + ametoctradin (45) fluopicolide (43) copper (M1) maneb (M3) mancozeb (M3) metiram (M3) ziram (M3) captan (M4) chlorothalonil (M5)
	Phytophthora foliar blight	dimethomorph (40) + ametoctradin (45) fluopicolide (43) chloropicrin (F)
Brassica leafy vegetables[b]	Downy mildew	boscalid (7) + pyraclostrobin (11) fenamidone (11) fosetyl-al (33) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) mandipropamid (40) dimethomorph (40) + ametoctradin (45) fluopicolide (43) *Bacillus subtilis* strain QST 713 (44) copper (M3) chlorothalonil (M5)
Basil	Downy mildew	N/A
Lettuce	Downy mildew	metalaxyl (4) + mancozeb (M3) fosetyl-al (33) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) mandipropamid (40) dimethomorph (40) + ametoctradin (45) fluopicolide (43) ametoctradin (45) *Bacillus subtilis* strain QST 713 (44)
Endive, radicchio		mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) + ametoctradin (45) fluopicolide (43) ametoctradin (45)

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
Cucurbit vegetables[b]	Phytophthora foliar blight	dimethomorph (40) + ametoctradin (45) fluopicolide (43)
	Downy mildew	fenamidone (11) pyraclostrobin (11) cyazofamid (21) propamocarb hydrochloride (28) + chlorothalonil (M5) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) dimethomorph (40) + ametoctradin (45) fluopicolide (43) *Bacillus subtilis* strain QST 713 (44) copper (M3) maneb (M3) mancozeb (M3) folpet (M4) chlorothalonil (M5) citric acid + lactic acid (NC)
Grape	Downy mildew	metalaxyl (4) + mancozeb (M3) boscalid (7) + pyraclostrobin (11) kresoxim-methyl (11) zoxamide (22) zoxamide (22) + mancozeb (M3) dinocap (29) + mancozeb (M3) mono- and di-basic sodium, potassium and ammonium phosphites (33) dimethomorph (40) dimethomorph (40) + ametoctradin (45) mandipropamid (40) fluopicolide (43) ametoctradin (45) copper (M3) mancozeb (M3) metiram (M3) captan (M4) folpet (M4) citric acid + lactic acid (NC)
Blueberry (highbush, lowbush)	Phytophthora foliar blight	N/A
	Anthracnose fruit rot	metconazole (3) boscalid (7) + pyraclostrobin (11) cyprodinil (9) + fludioxonil (12) pyraclostrobin (11) fluazinam (29) fosetyl-al (33) chlorothalonil (M5)
Strawberry	Leather rot	mono- and di-basic sodium, potassium and ammonium phosphites (33)

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
Outdoor ornamentals[b]	Phytophthora root rot and foliar blight	metalaxyl (4) etridiazole (14) propamocarb hydrochloride (28) fosetyl-al (33) mono- and di-basic sodium, potassium and ammonium phosphites (33) fluopicolide (43) *Bacillus subtilis* strain QST 713 mancozeb (M3) chlorothalonil (M5) metam-sodium (F) *Streptomyces* sp. (NC) *Trichoderma harzianum* strain KRL-AG2 (NC) *Trichoderma virens* strain G-41 (NC)

[a] Winfield Phosphite Extra does not have post-harvest uses on potato.

[b] Certain alternatives listed in this table are registered exclusively on specific commodities from the crop groups.

Table 3.2 Summary of Fungicide Alternatives for the Uses Supported with Winfield Phosphite Turf

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
Turf	Pythium blight	propiconazole (3) + azoxystrobin (11) azoxystrobin (11) pyraclostrobin (11) propamocarb hydrochloride (28) fosetyl-al (33) mono- and di-basic sodium, potassium and ammonium phosphites (33)

Table 3.3 Summary of Fungicide Alternatives for the Uses Supported with Confine Post

Crop / Crop group	Disease	Active Ingredient and Resistance Management Group
Potato	Late blight	mono- and di-basic sodium, potassium and ammonium phosphites (33)
	Pink rot	mono- and di-basic sodium, potassium and ammonium phosphites (33)
	Silver scurf	iprodione (2) mono- and di-potassium salts of phosphorous acid (33) *Bacillus subtilis* strain QST 713 (44)

Table 4.1 Use (label) Claims Proposed by Applicant for Winfield Phosphite Colorless / Winfield Phosphite Extra[a] and Whether Acceptable or Unsupported

Proposed claim	VSAD comments
Potato: suppression of late blight (*Phytophthora infestans*) and pink rot (*Phytophthora erythroseptica*) with a maximum of 5 applications (foliar, sprinkler chemigation) at 5-10 L/ha.	Supported on a 7-14 day schedule.

Proposed claim	VSAD comments
Potato: suppression of late blight (*Phytophthora infestans*), pink rot (*Phytophthora erythroseptica*) and silver scurf (*Helminthosporium solani*) with a post-harvest treatment. Dilute Winfield Phosphite Colorless at a 1:5.13 ratio. Apply 2 L of this solution as a spray to 1000 kg potatoes prior to storage. To be used only on russet-skinned varieties or potatoes intended for processing.	Supported on all potato types.
Fruiting vegetables (eggplant, tomato, tomatillo, pepper): suppression of late blight (*Phytophthora infestans*) with a maximum of 5 applications (foliar, sprinkler chemigation) at 5-10 L/ha on a 14-28 day schedule.	Supported on a 7-14 day schedule.
Brassica leafy vegetables (broccoli, Brussels sprout, cabbage, cauliflower, cavalo broccoli, collard, Chinese cabbage, Chinese mustard cabbage, kale, kohlrabi, mizuna, mustard greens, mustard spinach and rapegreens): suppression of downy mildew (*Peronospora parasitica*) with a maximum of 6 foliar applications at 3-10 L/ha on a 7-21 day schedule.	Supported at 3-6 L/ha. *Peronospora parasitica* is now named *Hyaloperonospora parasitica*.
Leafy vegetables (amaranth, aragula, cardoon, celery, chervil, corn salad, endive, fennel, lettuce, parsley, radicchio, rhubarb, spinach, Swiss chard): suppression of downy mildew (*Bremia lactucae*) with a maximum of 6 foliar applications at 3-10 L/ha on a 14-21 day schedule.	Supported on lettuce, endive and radicchio at 3-7 L/ha on a 7-14 day schedule.
Basil: suppression of downy mildew (*Peronospora belbehrii*) with a maximum of 6 foliar applications at 3-10 L/ha on a 14-21 day schedule.	Supported at 3-5 L/ha on a 7-14 day schedule.
Cucurbit vegetables (cucumber, Chinese waxgourd, citron melon, gherkin rock melon, **honeydew melon, pumpkin, zucchini, water melon, summer and winter squash, *Momordica* spp.)**: suppression of downy mildew (*Pseudoperonospora cubensis*) with a maximum of 6 foliar applications at 3-8 L/ha.	Supported at 3-5 L/ha on a 7-14 day schedule.
Grape: suppression of downy mildew (*Plasmopara viticola*) with a maximum of 9 foliar applications at 2.9 L/ha (pre-bloom) and 5.8 L/ha (post-bloom). Application intervals ≥ 3 days.	Supported on a 7-14 day schedule.
Berries (blackberry, blueberry, caneberries, cranberry, currant, elderberry, gooseberry, huckleberry, loganberry, raspberry): suppression of anthracnose fruit rot (*Colletotrichum acutatum*) with a maximum of 5 foliar applications at 3-8 L/ha.	Supported on blueberry (highbush and lowbush) at 4-5 L/ha on a 7-21 day schedule.
Strawberry: suppression of leather rot (*Phytophthora cactorum*) with a maximum of 5 foliar applications at 3-8 L/ha.	Supported at 4-5 L/ha on a 7-day schedule.

Proposed claim	VSAD comments
Ornamentals and bedding plants: suppression of *Phytophthora* with a maximum of 9 foliar applications at 5-7 L in a minimum of 100 L water on a 14-28 day schedule.	Supported on outdoor ornamentals (including bedding plants, potted plants and cut flowers) for suppression of phytophthora root rot and foliar blight (*Phytophthora* spp., except *P. ramorum*, *P. cryptogea*) at 1.3 L/100 L water.
Ornamentals and bedding plants: suppression of *Phytophthora* with a maximum of 9 drench applications at 1.0-2.0 L in a minimum of 100 L water. Apply 5.0-10.0 L diluted solution/m^2 on a 14-21 day schedule. Adjust volume to wet media.	Supported on outdoor ornamentals (including bedding plants, potted plants and cut flowers) for suppression of phytophthora root rot and foliar blight (*Phytophthora* spp., except *P. ramorum*, *P. cryptogea*) at 1.3 L/100 L water on a 14-28 day schedule.
Fruiting vegetables (eggplant, tomato, tomatillo, pepper): suppression of phytophthora root rot (*Phytophthora* spp.) with a maximum of 5 applications (foliar, sprinkler chemigation) at 5-10 L/ha on a 14-28 day schedule.	Supported for suppression of phytophthora foliar blight on a 7-14-day schedule. Confirmatory value information is required.
Cucurbit vegetables (cucumber, Chinese waxgourd, citron melon, gherkin rock melon, honeydew melon, pumpkin, zucchini, water melon, summer and winter squash, *Momordica* spp.): suppression of sudden wilt (*Phytophthora* spp.) with a maximum of 6 foliar applications at 3-8 L/ha.	Supported for suppression of phytophthora foliar blight (*Phytophthora capsici*, *P. nicotiniae*) at 5-6 L/ha on a 7-14 day schedule. Confirmatory value information is required.
Berries (blackberry, blueberry, caneberries, cranberry, currant, elderberry, gooseberry, huckleberry, loganberry, raspberry): suppression of phytophthora root rot and foliar blight (*Phytophthora* spp.) with a maximum of 5 foliar applications at 3-8 L/ha.	Supported for suppression of phytophthora foliar blight (*Phytophthora cinnamomi*) on blueberries (highbush and lowbush) at 6 L/ha on a 14-28 day schedule. Confirmatory value information is required.
Ornamentals and bedding plants: suppression of downy mildew with a maximum of 9 foliar applications at 2.5-5 L in a minimum of 100 L water on a 14-28 day schedule.	Supported on outdoor ornamentals (including bedding plants, potted plants and cut flowers) for suppression of downy mildew (*Peronospora lamii*) at 1.3 L/100 L water on a 7-day schedule. Confirmatory value information is required.
Fruiting vegetables (eggplant, tomato, tomatillo, pepper): suppression of phytophthora root rot (*Phytophthora* spp.) with a pre-plant root dip treatment at 5 L/100 L water.	Not supported. No value information was provided in support of this claim.
Brassica leafy vegetables (broccoli, Brussels sprout, cabbage, cauliflower, cavalo broccoli, collard, Chinese cabbage, Chinese mustard cabbage, kale, kohlrabi, mizuna, mustard greens, mustard spinach and rapegreens): suppression of phytophthora root rot (*Phytophthora* spp.) with a maximum of 6 foliar applications at 3-10 L/ha on a 7-21 day schedule.	Not supported. No value information was provided in support of this claim.
Cucurbit vegetables (cucumber, Chinese waxgourd, citron melon, gherkin rock melon, honeydew melon, pumpkin, zucchini, water melon, summer and winter squash, *Momordica* spp.): suppression of gummy stem blight (*Didymella bryoniae*) with a maximum of 6 foliar applications at 3-8 L/ha at 21-day intervals.	Not supported. Low efficacy results were achieved in the one submitted field trial.

Proposed claim	VSAD comments
Ginseng: suppression of phytophthora root rot and foliar blight (*Phytophthora* spp.) with a maximum of 5 foliar applications at 3-8 L/ha.	Not supported. The end-use product as well as the proposed rates and method of application were not tested under field conditions. No assessments were performed on ginseng roots.
Strawberry: suppression of red stele (*Phytophthora fragariae*) with a pre-plant root dip treatment at 5 L/100 L water.	Not supported. No value information was provided in support of these claims.
Strawberry: suppression of red stele (*Phytophthora fragariae*) with a maximum of 5 foliar applications at 3-8 L/100 L water.	
Ornamentals and bedding plants: suppression of *Fusarium*, *Pythium*, *Rhizoctonia*, fire blight (*Erwinia amylovora*), bacterial blight (*Xanthomonas campestris*), geranium wilt (*Ralstonia* spp.) and powdery mildew with a maximum of 9 foliar applications at 5-7 L in a minimum of 100 L water on a 14-28 day schedule.	Not supported. Low and inconsistent efficacy results were achieved with MDP or related active ingredients against pythium root rot on geranium, poinsettia and impatiens (3 greenhouse trials). No other value information was provided in support of these claims.
Ornamentals and bedding plants: suppression of *Fusarium*, *Pythium*, *Rhizoctonia*, fire blight (*Erwinia amylovora*), bacterial blight (*Xanthomonas campestris*) and geranium wilt (*Ralstonia* spp.) with a maximum of 9 drench applications at 1-2 L in a minimum of 100 L water. Apply 5-10 L diluted solution/m^2 on a 14-21 day schedule.	
Ornamentals and bedding plants: suppression of *Phytophthora*, *Fusarium*, *Pythium*, *Rhizoctonia*, fire blight (*Erwinia amylovora*), bacterial blight (*Xanthomonas campestris*) and geranium wilt (*Ralstonia* spp.) with a maximum of 9 applications through sprinkler irrigation at 2.5-5 L in a minimum of 100 L water. Apply with normal irrigation schedule at 14-28 day intervals.	Not supported. No value information was provided in support of these claims.
Ornamentals and bedding plants: suppression of *Phytophthora*, *Fusarium*, *Pythium*, *Rhizoctonia*, fire blight (*Erwinia amylovora*), bacterial blight (*Xanthomonas campestris*) and geranium wilt (*Ralstonia* spp.) with a pre-plant root dip treatment at 5 L/100 L water.	
Conifers and trees in commercial nurseries, plantations and forests, landscapes and parks (including Christmas tree, oak and pine): suppression of *Phytophthora* with a maximum of 9 foliar applications at 2.5-5 L/ha on a 14-28 day schedule.	Not supported. Inconsistent efficacy was achieved with foliar and drench applications of MDP or related active ingredients against phytophthora root rot on Fraser fir. In addition, foliar and drench applications did not provide season-long suppression or control of sudden oak death.
Conifers and trees in commercial nurseries, plantations and forests, landscapes and parks (including Christmas tree, oak and pine): suppression of *Phytophthora* with a maximum of 9 drench applications at 1-2 L/100 L water on a 14-21 day schedule.	

Proposed claim	VSAD comments
Conifers and trees in commercial nurseries, plantations and forests, landscapes and parks (including Christmas tree, oak and pine): suppression of *Phytophthora* with a pre-plant root dip treatment at 5 L/100 L water.	Not supported. No value information was provided in support of this claim.

[a] Winfield Phosphite Extra does not have post-harvest uses on potato.

Table 4.2 Use (label) Claims Proposed by Applicant for Winfield Phosphite Turf and Whether Acceptable or Unsupported

Proposed claim	VSAD comments
Turf: suppression of *Pythium* with a maximum of eight applications (foliar, chemigation) at 50-100 mL/100 m^2 on a 14-21 day schedule.	Supported for suppression of pythium blight (*Pythium aphanidermatum*) with a maximum of eight foliar applications at 104 – 250 mL/100 m^2 intervals in 4 – 10 L water/100 m^2 on a 14-day schedule.
Turf: suppression of anthracnose (*Colletotrichum graminicola*) with a maximum of eight applications (foliar, chemigation) at 50-100 mL/100 m^2 on a 14-21 day schedule	Not supported. The efficacy expressed with MDP or related active ingredients would not be considered acceptable on high value turf such as that found on golf courses or sod farms.

Table 4.3 Use (label) Claims Proposed by Applicant for Confine Post and Whether Acceptable or Unsupported

Proposed claim	VSAD comments
Potato: suppression of late blight (*Phytophthora infestans*), pink rot (*Phytophthora erythroseptica*) and silver scurf (*Helminthosporium solani*) with a post-harvest treatment. Dilute 500 mL Confine Post up to 2 L water. Apply this solution as a spray to 1000 kg potatoes prior to storage. To be used only on russet-skinned varieties or potatoes intended for processing.	Supported on all potato types.

References

A. List of Studies/Information Submitted by Registrant

1.0 Chemistry

PMRA Document Number	Reference
1510693	2000, Agri-Fos 400: Product Identity and Composition, Description of Beginning Materials, Description of Production Process, Discussion of Formulation Impurities, DACO 2.11, 2.11.2, 2.11.4
2009691	2009, Product Identity and Composition, Description of Beginning Materials, Description of Production Process, Discussion of Formulation Impurities and Certified Limits for Confine Extra, DACO 2.11.3
1879536	2009, Preliminary Analysis, DACO 3.2, 3.4
1879535	2009, Physical and Chemical Characteristics: Color, Physical State, Odour, Stability to Normal and Elevated Temperature - Metal and Metal; ion, pH, Boiling Point, Density/Relative Density, Dissociation Constant, Viscosity and Water Solubility, DACO 3.5.2
1920582	2010, Storage Stability and Corrosion Characteristics, DACO 3.5.8, 3.5.9, 3.5.10, 3.5.11, 3.5.12, 3.5.13, 3.5.14, 3.5.15
1920580	Container material and description, DACO 3.5.5
2008979	Response to DACO 3.5.10, 3.5.14
1510696	2000, Preliminary Analysis of Agri-Fos 400, 005367/1-5, DACO 2.13.1, 2.13.2, 2.13.3, 2.13.4
1636528	Response to the clarification of 2008/09/09
1640247	2008, Calculation of active, response to the clarification of 2008/09/09
1920650	Container material and description, DACO 3.55
2008968	Response to DACO 3.5.10 and 3.5.14

2.0 Human and Animal Health

PMRA Document Number	Reference
1879537	2009, Acute Oral Toxicity Up and Down Procedure in Rats, DACO: 4.6.1
1879539	2009, Acute Dermal Toxicity in Rats, DACO: 4.6.2
1879541	2009, Acute Inhalation Toxicity Study in Rats - Limit Test, DACO: 4.6.3
1879542	2009, Primary Eye Irritation Study in Rabbits Toxicity Study in Rats - Limit Test, DACO: 4.6.4
1879543	2009, Primary Skin Irritation Study in Rabbits, DACO: 4.6.5
1879544	2009, Dermal Sensitization in Guinea pigs (Buehler Method), DACO: 4.6.6
1920583	2007, Use description, DACO: 5.2, 2010-0766
1920653	2010, Use description, DACO: 5.2, 2010-1161
1924288	2010, Use description Scenario, DACO: 5.2, 2010-1164

3.0 Environment

PMRA Document Number	Reference
1920612	2010, Waiver DACO Part 9, DACO: 9.1,9.2.4.1,9.2.4.2,9.2.4.3,9.2.5,9.2.6,9.2.7,9.3.2,9.5.2.1,9.5.2.2,9.5.2.3,9.6.2.1,9.6.2.2,9.6.2.3,9.6.2.4,9.6.2.5,9.6.2.6,9.8.4
2076065	2009, Honey Bee Acute Contact Toxicity, DACO: 9.2.4.2
2076066	2009, *Daphnia magna* 48-Hour Acute Toxicitry Test, DACO: 9.3.2
2076068	2009, Rainbow Trout (*Oncorhynchus mykiss*) 96-Hour Acute Toxicity Test, DACO: 9.5.2.1
2076069	2009, Avian Acute Oral Toxicity Test with Confine Extra (potassium phosphite) in Mallard Ducks (*Anas Platyrhynchos*), DACO: 9.6.2.2

2076070 2009, Avian Acute Dietary Toxicity Test (LC50) with Confine Extra (potassium phosphite) in Mallard Ducks (*Anas Platyrhynchos*), DACO: 9.6.2.5

4.0 Value

PMRA Document Number	Reference
1879273	2007, Non Safety effects, DACO: 10.3.2(B)
1879277	2007, Efficacy of registered and unregistered fungicides for control of Phytophthora root rot of African Daisy, 2007, DACO: 10.2.3.3
1879278	2009, Agronomy Company of Canada Confine Late Blight, DACO: 10.2.3.3
1879279	2007, Efficacy of registered and unregistered fungicides for control of Phytophthora root rot of Azalea, 2006, DACO: 10.2.3.3
1879280	2005, Efficacy of Cyazofamid, Fenstar and other fungicides for control of Phytophthora root rot of Azalea, 2004, DACO: 10.2.3.3
1879281	2005, Efficacy of Dimethomorph, phosphites and other fungicides for control of Phytophthora root rot of Azalea, 2004, DACO: 10.2.3.3
1879282	2006, Efficacy of registered and unregistered fungicides for control of Phytophthora root rot of Azalea, 2004, DACO: 10.2.3.3
1879283	2008, Evaluation of Prophyl, alone and in combination, for post infection control of downy mildew on Basil, Fall 2007, DACO: 10.2.3.3
1879284	2008, Evaluation of fungicides for control of downy mildew on Basil, Fall 2007, DACO: 10.2.3.3
1879285	2008, A comparison of Prophyl, Previcur, and Revus for control of downyl mildew on basil, Fall 2007, DACO: 10.2.3.3
1879286	2008, A comparison of select biofungicides and conventional fungicides for control of downyl mildew on basil, Fall 2007, DACO: 10.2.3.3
1879287	2008, A comparison of Rescue, Amistar, and Forum for control of downyl mildew on basil, Fall 2007, DACO: 10.2.3.3
1879288	2000, Evaluation of Fungicides for control of phomopsis twig blight of blueberry, 1999, DACO: 10.2.3.3

1879289 2000, Comparison of Fungicides for mangement of foliar diseases of blueberry, 1999, DACO: 10.2.3.3

1879290 2000, Chemical control of anthracnose fruit rot of blueberriess, 1999, DACO: 10.2.3.3

1879291 2006, Use of phosphite material for control of pythium and other root species in in a high-Density blueberry production system, DACO: 10.2.3.3

1879292 2007, Evaluating reduced risk fungicides for anthracnose control in blueberriess, 2006, DACO: 10.2.3.3

1879293 2005, Fungicidal Control of Septoria and anthracnose leaf spots of Blueberry , 2004, DACO: 10.2.3.3

1879294 2006, Fungicidal Control of Pythium Root Rot of Blueberry in a High Density Bark Planting, 2005, DACO: 10.2.3.3

1879295 2006, Fungicidal Control of Septoria and anthracnoseleaf spots of Blueberry, 2005, DACO: 10.2.3.3

1879296 2006, Fungicides for Control of Septoria leaf spots of Blueberry, 2005, DACO: 10.2.3.3

1879297 2007, Fungicidal Control of phytophthora root rot of blueberry in a high-Density Bark Planting in North Georgia, 2006, DACO: 10.2.3.3

1879298 2006, Evaluation of fungicides and dormant sprays for control of mummy berry in blueberries, 2005, DACO: 10.2.3.3

1879299 2006, Evaluation of fungicides for control of anthracnose fruit rot in "Jersey" blueberriess, 2005, DACO: 10.2.3.3

1879300 2006, Evaluation of assorted foliar applications for control of downy mildew of Chinese broccoli, spring 2005, DACO: 10.2.3.3

1879301 2006, Evaluation of a phosphonic fungicide, alone and in combination for downy mildew control on Chinese broccoli, spring 2005, DACO: 10.2.3.3

1879302 2006, Evaluation of Reason and A12946B for downy mildew control onChinese broccoli, Spring 2005, DACO: 10.2.3.3

1879303 2006, Influence of Spray initiation on downy mildew control on Chinese broccoli, Spring 2005, DACO: 10.2.3.3

1879304 2008, Evaluation of fungicides for control of downy mildew of cabbage, Sampson County, 2007, DACO: 10.2.3.3

1879305 2005, Comparison of phosdphonic foliar applications for control of downy mildew on Chinese broccoli, Spring 2004, DACO: 10.2.3.3

1879306 2008, Evaluation of Fungicides applied after infection for control of downy mildew on collard, 2007, DACO: 10.2.3.3

1879307 2008, Effectiveness of serenade. Snaota and Prophyt winthin a biopesticide instensive IPM system for management of downy mildew on broccoli, DACO: 10.2.3.3

1879308 2006, Assessment of fungicide efficacy for management of downy mildew on broccoli, 2005, DACO: 10.2.3.3

1879309 2008, Evaluation of fungicides for the control of downy mildew on Coleus, 2007, DACO: 10.2.3.3

1879310 2008, Evaluation of Fungicides for control of cranberry fruit rot in Winconsin, 2007, DACO: 10.2.3.3

1879314 2006, Evaluation of fungicides for control of downy mildew of cucumber, 2005, DACO: 10.2.3.3

1879315 2008, Evaluation of fungicides for control of downy mildew on pickling cucumbers, 2007, DACO: 10.2.3.3

1879316 2007, Evaluation of fungicides for control of downy mildew of cucumber II, 2006, DACO: 10.2.3.3

1879317 2005, Evaluation of fungicides for control of downy mildew of cucumber, 2004, DACO: 10.2.3.3

1879318 2008, Evaluation of experimental and labeled fungicides for the control of downy mildew in pickling cucumber, 2007, DACO: 10.2.3.3

1879319 2008, Evaluation of fungicides for control of downy mildew of cucumberand winter squash, 2007, DACO: 10.2.3.3

1879321 2006, Evaluation of fungicides for the control of downy mildew in pickling cucumber, 2005, DACO: 10.2.3.3

1879322 2008, Evaluation of fertilizers (phosphite, calcium silicate), biological agent, imidacloprid insecticide and row covers for integrated management of cucumber bacterial wilt, 2007, DACO: 10.2.3.3

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B. Additional Information Considered

i) Published Information

1.0 Environment

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